

GALLS FOUND IN THE VICINITY OF TORONTO.—No. 4.

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Rhabdophaga strobiloides, Walsh; *Cecidomyia strobiloides*, O. S.

This is a common willow gall in the vicinity of Toronto, restricted to *Salix humilis*; the galls are very uniform in size and form, usually top-shaped, some inclining to spherical, a little oblate below and prolate above, and as the female oviposits but one egg in the terminal bud of the willow shoot, the galls are terminal and monothalamous.

The gall is a rather tightly and regularly arranged mass of from 70 to 80 aborted leaves, representing perhaps about 1 m. of the leafage of a normal branch.

This has been called the "pine-cone-like-gall"; there may be a suggestion of a resemblance to cones of *Pinus resinosa*, but not to cones of *P. strobus*.

From December 4, 1883, to March 21, 1898, nine annual collections of galls were made, all in the vicinity of Toronto, in all about 1,000 specimens. The average measurement of 200 galls was 12 mm. x 15 mm., and the length of the deformed part of the branch, included in the gall, around which the aborted leaves were packed, was 6 mm.

The larvæ occupy cells central in the galls, formed by the folding of aborted leaves; they are tightly wrapped up in these, head downwards, and no doubt the irritation from the activity of feeding by gnawing the growing end of the twig causes the aborting of the leaves and the development of the gall.

The larvæ mature in the fall and are about 6 mm. long, of a straw colour inclining to orange. They pupate early in the spring or late in the fall, and the pupæ are closely wrapped up in fragile silken cocoons.

The imagoes usually emerge during the first week in May; it may be occasionally that the larvæ emerge from the gall in the fall, hibernate among leaves or other rubbish on the ground, and pupate in the spring; anyway, in two cases, when I had collected the galls early in the fall, I found living mature larvæ on the bottom of the jar.

Although the date of emergence of the imago is usually early in May, I found it range from April 4 to May 15. No doubt the date depends on the temperature of the season. When the temperature is warm the

imagoes do not live long; I never could keep them in captivity more than three days, but when kept in the cold I have had them over a week, and when brought into the warmth they were perfect and active; when kept in a large glass jar they paired readily, and the females oviposited in the terminal buds of living willow twigs. I tried them with different kinds of food, sugar, starch, glucose, cherry-tree gum and water, but I could not get them to eat. I do not think that during their brief imago life they either eat or drink.

There are four species of inquilines more or less common in this gall, the most noteworthy being the minute and beautiful *C. albovitta*, Walsh. I found mature larvæ of this inquiline resting in the downy folds of the aborted leaves, well within the gall. They are cylindrical in shape, slightly flattened ventrally, of a pale orange colour, and about $1\frac{1}{2}$ mm. long; I could find no evidence of feeding. The date of emergence ranged from April 14 to June 23; this extreme range may have been from artificial conditions, although I tried to secure natural conditions as much as possible. I found them quite numerous; one season I had 200 specimens from 54 galls; another season, 1892, I had 163 specimens from 35 galls.

The common sawfly inquiline emerged sparingly, every season about 2 to 100 galls. A small beetle and a small plume moth similar to the species that is inquiline in galls of *R. triticoides*, emerged rarely.

Among the hymenopterous parasites was the ichneumon, *Pimpla annulipes*. It was not common, and there was a suspicion that it was parasitic on the sawfly larvæ.

Two species of *Torymus*, one with an especially long ovipositor, both resplendent in metallic green and blue colors, emerged about the middle of June.

Two species of small Chalcid parasites emerged a little later than the *Torymus*, and it was thought that at least one of them was a secondary.

The geographical range of this gall is ample; it extends far to the south, and is common over Ontario. I have found it in Algonquin Park and in the Temagami District, and have galls from Southern and Northern Manitoba, from Alberta and from North Saskatchewan.

There are many complicated and interesting problems awaiting the student of Entomology, in working out the life-histories and interrelations

of the occupants of galls: The living feeding upon the living, without pain or apparent inconvenience, and all this while in the larval form.

Shall we say the relations are physiological and not pathological in any sense? The living plant fed upon by the gall-producer and the inquilines, these by the primary parasites, and these again by the secondaries. A harmonious system of eat and be eaten, and strangely at the same time the eater is often the eaten, and although, in the end, it means death to the eaten, it is not so shocking to our sensibilities as the cat enjoying the agonies of the tortured mouse or the sportsman triumphing over the "fluttering gory pinion."

Rhabdophaga siliqua, Walsh; *Cecidomyia salix-siliqua*, Walsh.

Galls nearly terminal on upland willow twigs (*Salix humilis*), flask or rather horn-shaped, usually curved, ending above in a slightly-curved beak, out of which the occupants emerge. The galls are aborted buds, and when overtopped by the twigs lie closely to them. The galls are often striated, of a greyish-green colour, corresponding to the colour of the twig, and rarely bear a few leaves. The average of 30 galls collected in the fall of 1882 was 7 x 12 mm. From this lot collected Dec., 1882, the producers, *R. siliqua*, emerged May, 1883, and towards the end of June numerous specimens of the Chalcid parasite, *Torymus splendidus*, emerged. Walker described and named this beautiful *Torymus* from specimens collected at Hudson's Bay, which may be accepted as presumptive evidence that this gall may be found there. In any case the geographical range is large. This gall is more or less common over Ontario where *Salix humilis* is found; it is more or less common in North York, Muskoka, Algonquin, Temagami, and along the Montreal River on *Salix discolor*. During the fall and winter seasons of 1886 and 1887, I received several parcels of this gall from Northern Manitoba, collected from some species of willow; they were in every particular similar to Toronto galls, but no producers emerged from them. In the spring of 1887 I received from Mrs. W. A. Ducker a parcel of galls collected at Banff, Alta., from a species of willow; in size and shape they were identical with Toronto and Manitoba galls. Mrs. Ducker wrote: "The galls are on the ends of willow branches. I do not know the willow, but both willow and galls are common all around Banff." Producers emerged

from these galls during the last week of April, 1887, and I failed to separate them from Toronto specimens.

From 1883 to 1888 several annual collections of galls were made, all from *S. humilis*, from Toronto and from a locality 35 miles north. From these emerged numerous specimens of the producer, the parasite *Torymus splendidus*, and a few specimens of the Chalcid parasite *Encyrtus bucculatricis*, Howard, a species seldom reported as occurring in Ontario.

Rhabdophaga cornu, Walsh, *Cecidomyia salix-cornu*.

These galls are deformed lateral buds towards the ends of branches of upland willow (*Salix humilis*). They vary much in form and size, from semi-cylindrical, measuring 9 x 25 mm., to somewhat ovoid, measuring 7 x 10 mm.: the average of 200 galls was 8 x 20 mm. The galls are flask-shaped, slightly curved, rounded at the base, tapering towards the upper end, which ends in a slightly curved beak, out of which the occupants emerge. They resemble the galls of *R. siliqua*, but are considerably larger. They are hard and woody, of a greyish-brown colour resembling that of the branches, and often bearing leaves, occasionally branchlets 1 to 3 inches long, and rarely ♂ and ♀ catkins. On August 1st, 1893, I found these galls full size, but soft, easily cut with a knife, and of a greenish-yellow colour corresponding to that of the branches of the season. Annual collections of galls were made from 1883 to 1893—most of these from near Toronto, some from distant points, Port Sydney, Muskoka, Temagami, and other localities. The date of emergence of producers varied from April 26 to May 12; the parasites *Torymus splendidus*, Walk., and *Encyrtus bucculatricis*, Howard, emerged about 20 days later, and still later emerged two species of Chalcid parasites, *Pteromalus* (?) especially numerous one season (1885). From a lot of galls sent to me from Owen Sound I reared two specimens of the parasite *Torymus Brodei*, Ashm., which is a more or less common parasite of the White Oak leaf galls, *Acrepsis pezomachoides*. Two seasons there emerged many specimens of a thrips; the function of these was probably inquiline. In cutting open some of the old galls, in one I found a curculionid beetle. The interior cell of the gall is ample, extending from the base to apex of tube, and in spring the larvæ and pupæ are enclosed in a fragile silken cocoon. The producer is a fine large Cecidomyid, one of the most beautiful of the group.

The geographical range is wide; I have received specimens from Oak Lake and Souris, Man., and from Tisdale, Sask.